

Developing Quantitative Research Skills and Conceptualising an Integrated Approach to Teaching Research Methods to Education Students

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Abstract

Increasingly, research methods in a core component of many undergraduate social science programmes. Education is no exception. Engaging students and developing their research skills, particularly in the area of quantitative methods, is challenging. This paper presents the redesign and reconceptualisation of a compulsory research methods in education module for 2nd year undergraduates. It highlights the approach taken and provides the results of a small exploratory study that was used to assess the students' attitudes towards the module. The results of the study indicate that overall the students had a positive attitude towards the new research methods module and that they exhibited confidence in their quantitative research skills.

Keywords: Research methods, quantitative skills, integrated approach

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1. Introduction

In recent years, there has been an increasing emphasis on educational research that can inform policy and practice in the United Kingdom. Along with this, the evidence-based movement, in both the United Kingdom and elsewhere, has permeated into the social sciences, particularly into education. Furthermore, the use of large-scale nationally representative data has gained momentum. Traditionally, educational research in the United Kingdom has been based on specific, small-scale samples and researchers have accordingly relied on qualitative techniques. It is our contention that the quality of educational research is contingent on future education researchers being equipped with the necessary skills to carry out meta-level research that can be used to inform policy, as well as being able to analyse context and population-specific educational processes and practices.

However, research methodology is in its relative infancy as a distinct field in Educational Studies; until quite recently, research students were left to acquire methodological skills on an *ad hoc* basis during the process of conducting their research (Garner, Wagner, & Kawulich 2009). Increasingly, universities have begun to emphasise the importance of sound and rigorous methodological research training at undergraduate and postgraduate levels (Crooks, Castleden & VanMeerveld 2010), although the form and status of this education varies between institutions. There is a growing recognition of the need to be equipped to use quantitative and qualitative research methods in educational research, to conduct quantitative data analysis, and to be able to handle large-scale national representative datasets. In light of these contextual changes, this paper (1) chronicles the processes and thinking behind the reconceptualisation of the teaching of research methods to undergraduate education students and (2) presents the results from a small exploratory study that investigated student attitudes towards research methods in education.

2. Conceptualising An Integrated Approach

2.1 Demystifying research

An explicit aim of our reconceptualised research methods in education course was to illustrate the accessibility and everyday relevance of research to our undergraduate students. However, in order to experience research as accessible and as meaningful (something they might have a stake in) we were concerned to emphasise the importance of being able to critically read research, as well being able to conduct research. Additionally, research had to be demystified and exposed as something we do in our everyday lives. As Gorard (2002a) suggests, anyone who is gathering information to answer a question (and so, solve a problem) is conducting research, including an act as simple as looking up train times in order to plan a rail journey. By challenging the exclusivity of academic knowledge, we wanted students also to recognise the mostly futile intra-disciplinary divide over the relative superiority of qualitative or quantitative research traditions. Our overarching goal was to simplify the process of research and introduce students to the notion that research is a process of 'finding things out' using a variety of techniques and tools (to match the variety of phenomena you might want to find out about).

A number of scholars (Giles, Ryan, Belliveau, DeFreitas and Casey 2006; Gorard, 2002b; Henson, Hull and Williams, 2010; Vandiver and Walsh, 2010) have pointed to the reasons why *all* researchers should be familiar with quantitative techniques: firstly, that part of the research process involves critical consumption of previous work in the field. Researchers thus need to have a frame of reference against which they can judge research design and results to be valid and reliable knowledge (Bridges, Gillmore, Pershing and Bates, 1998). Researchers who have no or only little understanding of quantitative research techniques are forced to accept numerical findings as true (given that they are not equipped to question them) or to ignore them entirely – both of which lead to potentially flawed or inaccurate knowledge (Bridges et al., 1998; Gorard 2003, p. 3). The focus on the interrelation between quantitative and qualitative techniques was central to our reconceptualisation of the research methods course and to rendering numerical analysis, in particular, more accessible to education students. Firstly, this

emphasis centred on making the research process an 'everyday' experience for lay people; secondly, we emphasised the need to use appropriate techniques depending on the information one is trying to obtain (hence, the need to engage with quantitative as well as qualitative techniques); thirdly, we focused on the overlaps that often exist between these two falsely-separated traditions, such as identifying and choosing a sample (Becker, 1996; Murtonen and Lehtinen, 2005).

A key catalyst for our renewed focus on quantitative research skills is the increasing attention given to evidence-based educational practice and policy (for key debates see Hammersley 2007). It is increasingly recognised that the majority of educational research has strived to represent and interpret the experiences of specific populations, often in specific contexts. While this has undoubtedly produced valuable knowledge about the diverse educational experiences of different social, ethnic and gender groups, this population-specific knowledge has been considered less reliable for informing policy and benchmarks for pedagogical practice. There is a clear need for educational researchers to warrant, or adequately justify, the conclusions they draw based on the data available to them. Questions have been asked in the US context, in particular, about the merits of basing national or even regional educational policy on data, or knowledge obtained, from a small and/or highly specific group of people (or institutions) (Cobb, Confrey, diSessa, Lehrer and Schaube, 2003; Murtonen and lehtinen, 2005; Shavelson and Towne, 2002)."

Lastly, we aimed to reconceptualise the undergraduate research methods course to emphasise the integrated and cyclical nature of research, and thus, of research techniques. It was our aspiration that a focus on the interrelation of research techniques would contribute to breaking down the traditional 'qualitative'/ 'quantitative' divide, and polarised view of research as either concerned with words *or* with numbers. A consequence of this dichotomy has been the fear and anxiety many students feel in relation to quantitative data analysis, in large part due to its association with maths and sums (Bridgest et al., 1998; Gal & Ginsburg 1994; Paxton, 2006).

2.2 Research as an active experience

Methods courses tend to be unpopular with students due to the complex and often specialised nature of course content (Murtonen and Lehtinen, 2003. As Epstein (1987, p. 71) has noted, 'No other part of [the curriculum] has been so consistently received by students with as much groaning, moaning, eye-rolling, hyperventilation and waiver strategizing as the research course.' Feedback from prior years for our undergraduate research methods course reinforced this lack of popularity and provided the catalyst for reconceptualising the teaching of the course. It has been emphasised that methods courses are essential for undergraduates planning to conduct their own research, as well as those students who do not see research as part of their academic or career trajectories, as "graduates still need to make informed decisions regarding research findings as part of their professional development." (Ball & Pelco 2006, p.147). We continued to view our research methods course as fulfilling these roles. However, we felt it was necessary for the students to not view the course as a means to an end but to engender a sense of inquiry within education and to have the knowledge to conduct rigorous research using the appropriate approaches and techniques.

The anxiety and negative affect associated with learning about quantitative methods in particular, may make the instruction of these courses uniquely challenging (Paxton, 2006). Introductory methods courses, including ours, tend to cover a wide range of methodologies, including quantitative and qualitative techniques and subject-specialised methods (e.g., trials and experimental design in psychology, or narrative analysis in sociology). Many courses also cover the oral and written dissemination of research findings in the shape and format of the given discipline. Traditionally, research methods teaching has centred on the textbook and required students to engage passively with hypothetical examples of research included in these. Most instructors continue to draw on the structure of introductory texts to organise their lectures, but most of these textbooks now include supplementary materials, such as exams and review questions to enhance the interactive experience of the course, as well as to enable lecturers to monitor students' progress (Ball & Pelco 2006). Further, the use of software packages for teaching statistics has become a greater focus in social science methods

teaching (e.g. Lehti and Lehtinen, 2005; Smith, 2003). In reorganising the course, we introduced a new key text that did have a number of supplementary materials available online to the student and instructor. These materials were made available to the students on the virtual learning environment. It was our aim to expose students to new technologies and to offer them an additional learning resource. We also wanted to increase students' engagement with the material covered by increasing the amount of formative assessment given, in the form of quizzes, review questions, and applied research activities. The virtual learning environment contained additional tools such as electronic flashcards, discussion boards, a glossary, and other such features that made for a more interactive learning experience.

In attempting to engage students with seemingly static and highly technical course content, the pedagogical emphasis is increasingly on student-centred and interactive activities. An increasingly popular 'active-learning experience' on research methods courses is the student-led research project (Ball & Pelco 2006; Vandiver and Walsh, 2010). The student-led research project involves original research conducted by one or more students that allows students to directly apply the knowledge they are expected to acquire through research methods classes. This includes being able to review the relevant literature to identify appropriate research questions (as different to reading about the concept of a literature review). Additionally, actually making the methodological decisions involved in designing and conducting research is clearly more meaningful than reading about the decisions researchers potentially have to make, in a textbook. Existing research suggests that active learning-teaching strategies may result in increased interest in and appreciation for research methods among students, and greater confidence in their self-perceived ability to conduct independent research (Vandiver and Walsh, 2010). While research in this area is relatively nascent, and conflicting accounts of the merits of student-led teaching in relation to achievement exist (e.g. Giles et al., 2006), there is consistent support for the notion that interactive teaching and *not* teaching directly from a textbook increases student enjoyment of methods courses (Giles et al., 2006; Lehti and Lehtinen, 2005; Paxton, 2006; Wilder, 2009). While active learning experiences were already part of the course, the reconceptualised course placed greater emphasis on these activities. For example,

students designed their own questionnaire, collected data using the questionnaire, and then analysed the data using SPSS in a later class during the course. It was important that the students did not just complete one aspect of the research process (e.g., design a questionnaire) but complete several parts of the process. Furthermore, the numerical analysis took on meaning beyond that of 'maths' and became relevant to the students' immediate experience and interests. We drew on the notion of 'progressive pedagogy' (Cuban, 2001) to connect course content to real-life situations, recognising that students' engagement with and understanding of concepts increases when problems that are relevant to their lives are utilised (Bridges et al., 1998; Wilder, 2009, 2010). Accordingly, the final assignment, which is concerned with planning a piece of research, was modified to draw upon students' particular research interests.

Ball and Pelco (2006, p. 148) premise their student-led research on the problem-based learning approach, which is viewed as self-directed learning that "leads to higher motivation, better retention of material, and the development of important reasoning and problem-solving skills". The instructor role is thus as facilitator rather than director of the learning process. The authors argue that while traditional lecture-exam style classes may cover a fuller range of topics, the problem-based learning approach offers students a greater in-depth understanding of research methods (learning by doing).

While a considerable amount of literature has focused on approaches and pedagogies for teaching quantitative research skills, fewer studies have gauged the attitudes and self-perceived abilities of students to engage with and use statistics. These factors are likely to influence the confidence of students and the confidence with which they approach quantitative methods. Gal and Ginsburg (1994) point out that undergraduate students frequently enter statistics courses with anxiety and negative feelings about the content of the course (added to this, most research methods courses are compulsory in tertiary education). As they write, "statistics courses are viewed by most college students as an obstacle standing in the way of attaining their desired degree." (Gal & Ginsburg 1994, p. 1). Similarly, we found that previous

years' student feedback on the portion of the course that addressed quantitative methods was overwhelmingly negative. Students expressed anxiety and confusion over the relevance of quantitative skills and their own ability to use them e.g. "Having not done maths to a high level I left many [statistics] sessions feeling I had no understanding of what had been covered." The association of quantitative research with maths is also expressed here; many social science students may perceive maths to be irrelevant to their degree subjects. However, some existing evidence suggests that success at secondary school and university-level maths is only weakly correlated with anxiety and experiencing difficulties on university statistics or quantitative methods courses (Birenbaum and Eylath, 1994; Murtonen and Titterton, 2004). This indicates that performance on quantitative skills tests only partly explains the anxiety and negativity many students experience in relation to quantitative methods courses (Murtonen, 2005; Williams, Payne, Hodgkinson and Poade, 2008).

Another often-identified problem related to the fear of quantitative research methods is poor retention of material covered (a problem which problem-based learning purports to overcome). It has thus been emphasised that tutors and departments should be aware of and engage with students' views in order to provide a better educational experience for students. Gal and Ginsburg's (1994) work conducted 20 years ago suggested that there are two desirable (and essential) outcomes of statistics teaching: firstly, this teaching should encourage future and further engagement with quantitative analysis, in a professional and personal capacity. In other words, students should not leave quantitative methods classes feeling apprehensive or nervous about statistics. Secondly, students should have some appreciation of the relevance of statistics to their everyday lives and should be able to think 'statistically' in relevant situations. Quantitative analysis should not be viewed as irrelevant to their lives or as a skill only a few, mathematically minded students can acquire and use effectively. These aims are echoed in more recent studies exploring teachers' aims and students' attitudes in relation to quantitative methods teaching (Henson, Hull and Williams, 2010; Murtonen and Lehtinen, 2003; Williams et al., 2008), indicating therefore that a persisting problem exists in this area. A significant part of the restructuring of the research methods course was to make quantitative data analysis more

accessible to the students. As previously discussed, feedback from prior years had highlighted that the quantitative data analysis portion of the course had not been satisfactory. Teaching had focused overwhelmingly on the use of mathematical formulae and reasoning rather than training students to use relatively simple arithmetic and common sense when consuming and conducting quantitative research (Gorard 2003). Using meaningful and real data with the students proved to be successful in engaging them with the data analysis classes. In the course we focused on ensuring that the students had hands-on experiences in conducting analysis and presenting data.

3. Exploratory Study

In this initial exploratory study we were interested to investigate whether reconceptualising the research methods course as described above would manifest itself in more positive student feedback, particularly in relation to quantitative research skills. While it is clear that a snapshot study with a relatively small group of students is unlikely to lead us to conclusive evidence of changed attitudes, a survey of student experience and attitudes may indicate whether a positive shift has occurred compared to previous years.

3.1 Methods

The population consisted of 31 undergraduate students who were enrolled in the Research Methods in Education module at the University of York. The module is a compulsory component of the BA in Educational Studies in the Department of Education. All the students were in year two and had taken no other modules in research methods in year one. Of the 31 students, 27 (87 percent) completed the online survey administered using the survey tool on the Virtual Learning Environment (VLE). The instrument consisted of 35 questions. Questions 1 through 31 used Likert scale response items (5=strongly agree, 4=agree, 3=neither agree nor disagree, 2=disagree, 1=strongly disagree) and questions 32 through 35 required the respondent to provide a short written answer to the question. The survey was anonymous and

students completed the survey during the second to last class of the module.

The instrument used was constructed specifically for the purpose of measuring the attitudes of students towards the research methods in education module. The items on the instrument fall into one of four components. These are items concerned with (1) students' understanding of research methods (2) students' confidence in research methods (3) students' motivation towards research methods, and (4) students' future orientation towards research methods. It should be noted that a version of this instrument is intended for future use after reliability and validity checks have been completed. It is beyond the scope of this paper to discuss the instrument's reliability and validity as more data needs to be collected with the instrument in order to conduct these tests satisfactorily.

The purpose of this study was two-fold. First, the instrument was administered to elicit information on the students' attitudes towards the Research Methods in Education module in light of changes that had been made to the content and delivery of the class. In addition, this study is an initial exploratory investigation into the measuring of undergraduate Education students' attitudes towards a compulsory module of research methods.

3.2 Results

Univariate analyses were conducted on the data in which the means were calculated for each of the items. The results are presented by the four components of the instruments (understanding, confidence, motivation, and future orientation), which have been shown to be of enduring importance in previous research. It should be noted that these components were constructed based on theory. It is beyond the scope of this study to conduct factor analysis on the attitudes instrument; however, this will form the basis of future work.

Table 1 contains the percentage distributions for the five measures of students' understanding of research methods. The first three items listed in Table 1 could be considered general items concerning students' understanding of research methods and the last two pertain directly to quantitative methods. Eighty-five percent (N=23) of the students reported that they strongly agreed or agreed with the statement that they understood the nature of educational research. In contrast, only one participant reported that they did not understand the nature of educational research. For the next two general understanding measures, nearly all the students reported knowing the purpose of taking a course in research methods and reported understanding how different research techniques are useful for collecting data (both 96 percent, N=26). For the two quantitative understanding measures, over 92 percent (N=25) of students reported that they thought quantitative data could be useful for answering research questions and 81 percent (N=22) strongly agreed or agreed with the statement that quantitative data is mainly useful for conducting statistical analysis. In contrast, only two participants disagreed with this statement. This result is of interest because while it is clear to see that the students view quantitative research as being useful for answering research questions they viewed its usefulness narrowly.

Table 1. Percentage distribution of students' reports of their understanding of research methods in education

| Items | Strongly agree | Agree | Neither agree nor disagree | Disagree | Strongly disagree |
|--|-----------------------|--------------|-----------------------------------|-----------------|--------------------------|
| I understand the nature of educational research. | 7.4 | 77.8 | 11.1 | 3.7 | 0.0 |
| I know the purpose for taking a course in educational research methods. | 40.7 | 55.6 | 3.7 | 0.0 | 0.0 |
| I understand how different research techniques are useful for collecting data. | 33.3 | 63.0 | 3.7 | 0.0 | 0.0 |
| I think quantitative data can be useful for answering research questions. | 22.2 | 70.4 | 7.4 | 0.0 | 0.0 |
| Quantitative data is mainly useful for conducting statistical analysis. | 7.4 | 74.1 | 11.1 | 7.4 | 0.0 |

Table 2 contains the percentage distributions for each of the items. The first five items listed in Table 2 are considered general items concerning students' confidence in research methods, the next five pertain specifically to students' attitudes concerning their confidence in research methods, and the remaining three are concerned with students' confidence in quantitative methods. Eighty-two percent (N=22) of students reported that they were anxious about their success in the research methods course and 41 percent (N=11) reported that they were not good at doing research. As a compulsory part of the programme and the students' first experience of research, these results are not surprising. However, this is clearly an indication of students' feelings towards research methods and an issue that needs addressing both in the short and long term. A third of the students (33 percent) reported being easily confused by the processes of the different research designs and 44 percent (N=12) said that they were unfamiliar with much of the language associated with educational research. Finally, 85 percent (N=23) of students indicated that they would use what they had learned in research methods in the future.

Table 2. Percentage distribution of students' reports of their confidence in research methods in education.

| Items | Strongly agree | Neither agree nor disagree | | Strongly disagree |
|---|----------------|----------------------------|----------|-------------------|
| | | Agree | Disagree | |
| I have anxiety about my success in this educational research module. | 29.6 | 51.9 | 7.4 | 3.7 |
| I am not good at doing research. | 11.1 | 29.6 | 25.9 | 3.7 |
| I am easily confused by the processes of the different research designs. | 7.4 | 25.9 | 40.7 | 3.7 |
| I am unfamiliar with much of the language associated with educational research. | 3.7 | 40.7 | 25.9 | 3.7 |
| I will never use any of the things I have learned in educational research methods. | 0.0 | 0.0 | 14.8 | 29.6 |
| I am willing to engage in new and unfamiliar tasks. | 22.2 | 77.8 | 0.0 | 0.0 |
| I can use the VLE efficiently. | 37.0 | 63.0 | 0.0 | 0.0 |
| I make good notes. | 22.2 | 40.7 | 22.2 | 0.0 |
| I find educational research textbooks difficult to read. | 14.8 | 40.7 | 18.5 | 0.0 |
| I deal with new material and concepts more effectively when I apply these in educational research activities. | 11.1 | 51.9 | 22.2 | 0.0 |
| Working with numbers makes me anxious. | 18.5 | 40.7 | 22.2 | 7.4 |
| I am confident working with numbers. | 3.7 | 11.1 | 33.3 | 7.4 |
| Quantitative data analysis is easier to do than I originally thought. | 7.4 | 48.1 | 33.3 | 0.0 |

It was important to gauge the students' confidence in using the virtual learning environment (VLE), reading research methods textbooks, and doing research activities because all three were an important part of the reworked research methods course. All the students reported that they could use the VLE efficiently. Fifty-five percent (N=15) indicated that they found research methods textbooks difficult to read while 26 percent (N=7) indicated that they did not. This

maybe a reflection of some of the students finding the language associated with research methods unfamiliar (see above). Nearly two-thirds of the students (63 percent) indicated that they dealt with concepts and materials better when they are applied to activities.

In terms of confidence with quantitative data, 59 percent (N=16) reported that working with numbers made them anxious. However, 55 percent (N=15) reported that quantitative data analysis was easier than they originally thought. Nine participants (33 percent) expressed no opinion. A major emphasis of the reorganisation of the course was to make the quantitative data analysis more accessible and a positive experience for the students especially in light of their obvious anxiety for working with numbers.

Table 3 contains the percentage distributions for the seven measures of students' motivation towards research methods. As expected over two-thirds (68 percent) of students reported that they were not motivated to take the research methods course. However, 56 percent (N=15) reported that they enjoyed learning about research methods in education. Only 5 students (19 percent) indicated that they did not enjoy the course. Given that the course is a compulsory part of their degree and the lack of engagement of prior cohorts, this result could be deemed as being positive.

As part of the reworking of the course, students were required to complete preparation and follow-up activities before and after class. The preparation activities required completing readings and answering short multi-choice quizzes, which were designed to see if the students understood key concepts. The follow-up activities largely involved completing a research task such as designing a questionnaire or collecting data. Eighty-one percent (N=22) of students reported that they always completed the preparation activities. However, the percentage was lower (56 percent) for the follow-up activities. The follow-up activities were considerably more time consuming and in many ways more difficult. This may explain why fewer students were motivated to complete all the follow-up activities.

Table 3. Percentage distribution of students' reports of their motivation towards research methods in education.

| Items | Strongly agree | Agree | Neither agree nor disagree | Disagree | Strongly disagree |
|--|----------------|-------|----------------------------|----------|-------------------|
| I never hear anything in a lecture that I feel I need to record. | 0.0 | 11.1 | 11.1 | 51.9 | 25.9 |
| I was not motivated to take the Research Methods module. | 14.8 | 44.4 | 11.1 | 25.9 | 3.7 |
| I enjoyed learning about educational research methods. | 0.0 | 55.6 | 25.9 | 14.8 | 3.7 |
| I always complete the preparation activities before coming to class. | 33.3 | 48.1 | 7.4 | 11.1 | 0.0 |
| I completed all the follow up activities. | 18.5 | 37.0 | 11.1 | 33.3 | 0.0 |
| The VLE was a helpful resource. | 48.1 | 33.3 | 7.4 | 7.4 | 0.0 |
| The multichoice quizzes were helpful in learning the concepts of educational research. | 18.5 | 44.4 | 18.5 | 11.1 | 7.4 |

Table 4 contains the percentage distributions for the 6 measures of students' future orientation towards research methods. The first two measures are general questions concerning students' future orientation towards research methods in education. All the students reported that they would use the information gained from the research methods course in their third year. While this result is of little surprise given that the students have to complete a piece of empirical research in their third year, it was interesting to see that 59 percent (N=16) of students believed they would use the information gained in their careers. Only four participants (15 percent) said they would not and 26 percent (N=7) were neutral in their response. This result suggests that we may have been successful in emphasising that research is accessible and meaningful not only in everyday life but in a professional capacity.

Table 4. Percentage distribution of students' reports of their future orientation towards research methods in education.

| Items | Strongly agree | Agree | Neither agree nor disagree | Disagree | Strongly disagree |
|--|----------------|-------|----------------------------|----------|-------------------|
| I will be able to use the information gained from educational research methods in my career. | 7.4 | 51.9 | 25.9 | 14.8 | 0.0 |
| I will be able to use the information gained from educational research methods in my third year. | 66.7 | 33.3 | 0.0 | 0.0 | 0.0 |
| I can use my experiences with SPSS in other situations/classes. | 14.8 | 40.7 | 33.3 | 7.4 | 3.7 |
| I think being able to do quantitative data analysis will be useful in the future. | 18.5 | 74.1 | 0.0 | 7.4 | 0.0 |
| I intend to do a research project that involves some quantitative data analysis. | 11.1 | 59.3 | 25.9 | 3.7 | 0.0 |
| I would have liked to have been taught more sophisticated methods of data analysis. | 0.0 | 29.6 | 25.9 | 44.4 | 0.0 |

The remaining four measures relate specifically to students' future orientation towards quantitative data analysis. As part of the course students received an introduction to the statistical software package SPSS. By the end of the session on SPSS the students were able to code and enter the data they had collected using the questionnaire they designed and conducted univariate and bivariate analysis on the data. In addition, the students did descriptive analysis on a large-scale national representative dataset. Over half the students (55 percent) reported that they would use SPSS in other situations or classes. Nearly all the students (93 percent, N=25) reported that they thought quantitative data analysis would be useful to them in the future. This result is particularly significant as it possibly indicates a more positive view of quantitative data analysis by the students and its potential usefulness to them. Over two-thirds of the students (70 percent) reported that they intend to do a research project that involves some quantitative data analysis and 30 percent (N=8) would have liked to have been taught more sophisticated methods of quantitative data analysis.

As previously discussed, in addition to the 31 questions that required the respondent to use Likert scale response categories, the survey also included four short answer questions. The open-ended questions aimed to elicit students' views on the research methods areas they felt most confident and interested in, and those they felt least confident and interested in. While students had indicated their confidence towards different research methods in the Likert scale items, we wanted to obtain more detailed information about the underlying reasons for more and less positive attitudes towards different research methods.

Nearly two thirds of students indicated that they felt most confident in designing questionnaires and/or analysing questionnaire data. Five students explicitly mentioned feeling most confident about using SPSS to analyse quantitative data. Contrary to our expectations based on prior student feedback, only three students indicated feeling most confident about qualitative research techniques e.g. observation or interview. Almost 60 percent of students indicated that they were most interested in questionnaire design and the use of SPSS to analyse numerical data. One student reported that they had "been absolutely dreading [the SPSS session]", but once everything had been explained, "it was simple and even enjoyable." Again, this supports the initial survey findings that students appear to hold a more positive view of quantitative research and their own ability to conduct it.

Nine students (33 percent) also indicated that they felt *least* confident about questionnaire design and the use of SPSS to analyse numerical data. However, with regard to low confidence, students were relatively equally divided across research methods topics. Thus, eight students reported that they were least confident about the language of educational research, the "technical terms" used in lectures. Six students felt least confident in using observation and interviews to collect data. We did not find the overwhelmingly negative response to quantitative research techniques and analysis that had characterised previous years' feedback. Accordingly, only 3 students reported that statistical analysis was the topic they were least interested in.

It should be reiterated that we do not consider these findings conclusive evidence of changed student attitudes towards quantitative research methods. Similarly we cannot assert that any change we observe relative to previous years' feedback is attributable to the current reconceptualisation of the methods course.

3.3 Summary

The major aims of this paper were to describe the reconceptualisation of a compulsory research methods course for education undergraduates, and to survey the students' attitudes towards research methods in general and quantitative analysis specifically. A key focus of the reorganisation of the course was to demystify quantitative research in particular by emphasising the cyclical and integrated nature of research methods.

We found that the majority (85 percent) of students understood the nature of educational research and 96 percent of students reported understanding how different research techniques can be useful for collecting data. The vast majority of students (92 percent) also thought that quantitative data specifically, could be useful for answering research questions. While 59 percent of students reported that working with numbers made them anxious, over half (55 percent) also reported that quantitative analysis was easier than they originally thought.

We were concerned to raise students' awareness of the utility of quantitative skills beyond their third year dissertations. Over two-thirds of students reported that they intended to use quantitative analysis in their research projects, and moreover, nearly all students reported that they thought that quantitative analysis would be useful to them in the future. The introduction of the VLE as an additional learning resource appeared to have been successful with 81 percent of students strongly agreeing or agreeing that the VLE was a helpful resource to them.

4. Discussion

This study provides some insight into undergraduate education students' attitudes towards compulsory research methods teaching, specifically the quantitative component of this module. This exploratory piece of research also chronicles the reconceptualisation of the research methods module, specifically in terms of demystifying research and viewing different research techniques as interrelated.

In terms of assessing effective statistics teaching, a primary aim was that students should not leave quantitative methods courses feeling anxious about maths and students should also be able to understand the relevance of quantitative research skills to their professional – if not personal – futures (Bridges et al., 1998; Gal and Ginsburg, 1994; Paxton, 2006; Williams et al., 2008) In order to be able to assess whether these outcomes had been met, we surveyed students about their understanding of research methods, their confidence towards research methods and their future orientation towards research methods. Students' attitudes were positive on the majority of items. The current reorganisation of the course, alongside the introduction of the VLE as an added teaching and learning resource, did appear to receive initial positive feedback from students, particularly in terms of quantitative research methods. This confirms existing evidence regarding the value of interactive methods (Giles et al., 2006; Lehti and Lehtinen, 2005), student-centred teaching and the application of quantitative methods to real-world issues (Cuban, 2001; Vandiver and Walsh, 2010; Wilder, 2009, 2010). The module itself might be further re-worked to incorporate a research project in order to increase students' confidence to independently conduct research, as well as to expand the practical element and relevance of the module (Vandiver and Walsh, 2010). Further, the more recent introduction of research literacy skills at earlier stages of the Education degree would enable a retrospective study of changes to students' understanding, confidence, motivation and future orientation to quantitative methods as they progress through their degree programme.

Clearly, this work must be replicated with a validated version of this instrument in order to be able to draw clearer and more generalisable conclusions about students' attitudes towards research methods. In future work, we also intend to survey students prior to the course commencing and on completion of the course in order to be able to gauge any attitudinal shifts that might have occurred during the module

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